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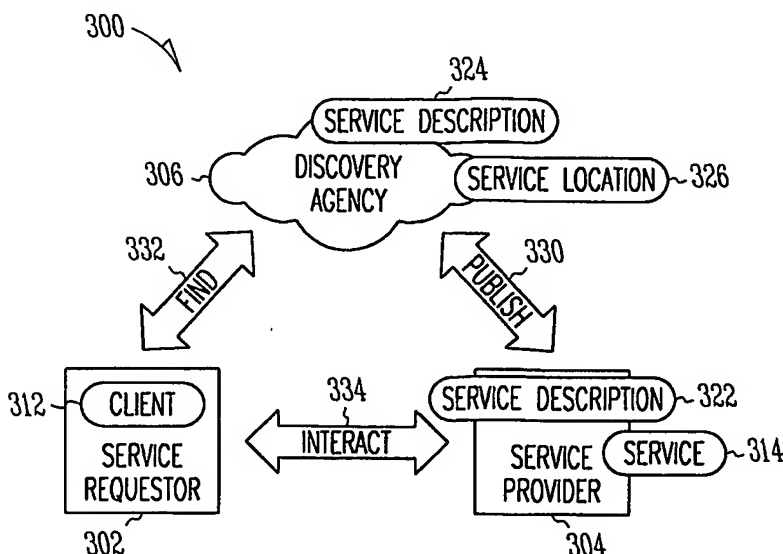
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(54) Title: A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT



(57) Abstract: A gaming services framework includes web services extensions and comprises a set of services, protocols, XML schemas, and methods for providing gaming system functionality in a distributed, network based architecture. Systems and methods provide a service-oriented framework for gaming and property management based upon internetworking technology and web services concepts. One aspect of the systems and methods includes a loosely coupled architecture that consists of software components that semantically encapsulate discrete functionality (self contained and perform a single function or a related group of functions - the component describes its own inputs and outputs in a way that other software can determine what it does, how to

invoke its functionality, and what result to expect). These components may be distributed and programmatically accessible (called by and exchange data with other software) over standard internetworking protocols (TCP/IP, HTTP, DNS, DHCP, etc.).

A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT

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Cross-reference to Related Applications

This patent application claims the priority benefit of U.S. Provisional Patent Application Serial No. 60/738,747 filed November 22, 2005 and entitled "A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT WITH WEB EXTENSIONS" (Attorney Docket 1842.225PRV).

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This application is also related to the following United States Patent Applications, which are assigned to the same assignee as the present application:

U.S. Application Serial No. 10/788,903 filed February 26, 2004 and entitled "A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT", (Attorney Docket 1842.020US1), which application claims priority from U.S. Provisional

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Application Serial No. 60/450,452 filed February 26, 2003 and entitled "A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT", (Attorney Docket 1842.020PRV);

U.S. Application Serial No. 10/788,661 filed February 26, 2004 and entitled "GAMING MANAGEMENT SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT", (Attorney Docket 1842.021US1);

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U.S. Application Serial No. 10/788,902 filed February 26, 2004 and entitled "GAME UPDATE SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT", (Attorney Docket 1842.022US1); and

U.S. Application Serial No. 10/789,957 filed February 26, 2004 and entitled "PROGRESSIVE SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT", (Attorney Docket 1842.023US1);

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all of the above which are hereby incorporated by reference herein for all purposes.

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Field

10 The inventive subject matter relates generally to software and hardware systems for gaming machines, and more particularly to providing a service-oriented gaming network environment on such systems.

Background

15 Today's gaming terminal typically comprises a computerized system controlling a video display or reels that provide wagering games such as video and mechanical slots, video card games (poker, blackjack etc.), video keno, video bingo, video pachinko and other games typical in the gaming industry. In addition, support computing systems such as accounting, player tracking and other "back office"
20 systems exist in order to provide support for a gaming environment.

In the past, the gaming terminals and back office systems have been developed using proprietary or closed hardware, operating systems, application development systems, and communications systems. Sometimes these systems are provided by a single vendor.

25 In order to prevent players from becoming bored, new versions of wagering games, and alterations to existing games are constantly being developed. Additionally, it is desirable to be able to enhance the back office systems with new features such as new accounting capabilities, new tracking capabilities, and new security capabilities.

30 Unfortunately, due to the proprietary or closed nature of previous systems, gaming system providers may be dependent on a single vendor to provide needed

features and enhancements. If the vendor is unable to provide such features in a timely manner, variety in innovation may be stifled, and a system provider may be unable to compete effectively. In addition, dependence on a single or few vendors may result in increased development costs for new features and enhancements.

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Summary

The above-mentioned shortcomings, disadvantages and problems are addressed by the inventive subject matter, which will be understood by reading and studying the following specification.

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One aspect of the systems and methods relates to a Gaming Services Framework using the World Wide Web and internetworking technology. The World Wide Web ("Web" from here on) is a networked information system comprising agents (clients, servers, and other programs) that exchange information. The Web and networking architecture is the set of rules that agents in the system follow, resulting in a shared information space that scales well and behaves predictably. The framework may be used on other networking technology, such as intranet technology or proprietary networking technology.

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The Gaming Services Framework comprises a set of services, protocols, XML schemas, and methods for providing secure gaming system functionality in a distributed, network based architecture. It is intended to be a service-oriented framework for gaming and property management based upon internetworking technology and web services concepts. Specifically, it supports a loosely coupled architecture that consists of software components that semantically encapsulate discrete functionality (self contained and perform a single function or a related group of functions – the component describes its own inputs and outputs in a way that other software can determine what it does, how to invoke its functionality, and what result to expect). These components are distributed and programmatically accessible (called by and exchange data with other software) over standard internetworking protocols (TCP/IP, HTTP, DNS, DHCP, etc.). Web service extensions are also included in some embodiments.

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The inventive subject matter describes systems, methods, and computer-

readable media of varying scope. In addition to the aspects and advantages of the inventive subject matter described in this summary, further aspects and advantages of the invention will become apparent by reference to the drawings and by reading the detailed description that follows.

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Brief Description of The Drawings

FIG. 1 is a perspective view of an exemplary embodiment of a gaming machine according to the inventive subject matter.

FIG. 2 is an example embodiment of a service-oriented network for distributed management in a gaming environment.

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FIG. 3 is an example embodiment of a general description of service-oriented discovery and interaction.

FIG. 4 is an example embodiment of a representation of the Gaming Services Protocol Stack.

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FIG. 5 illustrates an example embodiment of the implementation of web service extensions.

FIG. 6 illustrates one example embodiment of a method for using web service extensions according to the inventive subject matter disclosed herein.

20

Detailed Description

In the following detailed description of exemplary embodiments of the invention, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific exemplary embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical and other changes may be made without departing from the scope of the inventive subject matter.

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Some portions of the detailed descriptions which follow are presented in terms of algorithms and symbolic representations of operations on data bits within a computer memory. These algorithmic descriptions and representations are the ways

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used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities.

5 Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like. It should be borne in mind, however, that all

10 of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussions, terms such as "processing" or "computing" or "calculating" or "determining" or "displaying" or the like, refer to the action and processes of a computer system, or similar

15 computing device, that manipulates and transforms data represented as physical (e.g., electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission or display devices.

20 In the Figures, the same reference number is used throughout to refer to an identical component which appears in multiple Figures. Signals and connections may be referred to by the same reference number or label, and the actual meaning will be clear from its use in the context of the description.

The description of the various embodiments is to be construed as exemplary

25 only and does not describe every possible instance of the inventive subject matter. Numerous alternatives could be implemented, using combinations of current or future technologies, which would still fall within the scope of the claims. The present inventive subject matter is directed to a service-oriented framework for gaming networks that allows for the interoperability of the software components

30 (regardless of manufacturer, operating system, or application) reducing the

dependence on a closed-system, single vendor solutions and allowing for variety in innovation and competition.

The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the inventive subject matter is defined only by the appended
5 claims.

Operating Environment

FIG. 1 illustrates an exemplary gaming machine 10 in which embodiments of the invention may be implemented. In some embodiments, gaming machine 10 is
10 operable to conduct a wagering game. These wagering games may include reel based games such as video or mechanical slot machine games, card based games such as video poker, video dice games (e.g. a Yahtzee® like dice game) or other types of wagering games typical in the gaming industry. If based in video, the gaming machine 10 includes a video display 12 such as a cathode ray tube (CRT),
15 liquid crystal display (LCD), plasma, or other type of video display known in the art. A touch screen preferably overlies the display 12. In the illustrated embodiment, the gaming machine 10 is an "upright" version in which the display 12 is oriented vertically relative to a player. Alternatively, the gaming machine may be a "slant-top" version in which the display 12 is slanted at about a thirty-degree angle toward
20 the player. Further, the gaming machine may be a "bar-top" version in which the display is mounted horizontally in a bar top or table top. Still further, the gaming machine may be housed in a wall mounted or other vertically mounted cabinet. In yet further embodiments, the gaming machine may be housed in a portable or handheld device. In such devices, the user interface elements (buttons, screen etc.)
25 may be scaled down or eliminated in order to fit the elements into an appropriate housing for a handheld or portable gaming machine.

The gaming machine 10 includes a plurality of possible credit receiving mechanisms 14 for receiving credits to be used for placing wagers in the game. The credit receiving mechanisms 14 may, for example, include a coin acceptor, a bill
30 acceptor, a ticket reader, and a card reader. The bill acceptor and the ticket reader may be combined into a single unit. The card reader may, for example, accept

magnetic cards and smart (chip) cards coded with money or designating an account containing money.

In some embodiments, the gaming machine 10 includes a user interface comprising a plurality of push-buttons 16, the above-noted touch screen, and other possible devices. The plurality of push-buttons 16 may, for example, include one or more "bet" buttons for wagering, a "play" button for commencing play, a "collect" button for cashing out, a help" button for viewing a help screen, a "pay table" button for viewing the pay table(s), and a "call attendant" button for calling an attendant. Additional game specific buttons may be provided to facilitate play of the specific game executed on the machine. The touch screen may define touch keys for implementing many of the same functions as the push-buttons. Additionally, in the case of video poker, the touch screen may implement a card identification function to indicate which cards a player desires to keep for the next round. Other possible user interface devices include a keyboard and a pointing device such as a mouse or trackball.

A processor controls operation of the gaming machine 10. In response to receiving a wager and a command to initiate play, the processor randomly selects a game outcome from a plurality of possible outcomes and causes the display 12 to depict indicia representative of the selected game outcome. In the case of slots for example mechanical or simulated slot reels are rotated and stopped to place symbols on the reels in visual association with one or more pay lines. If the selected outcome is one of the winning outcomes defined by a pay table, the processor awards the player with a number of credits associated with the winning outcome.

FIG. 2 illustrates an example of a Gaming Service Network 210 comprising a customer data center 218 and a customer property 216. The data center 218 and customer property 216 are connected via a network 220. In some embodiments, network 220 is a public network such as the Internet. However, in alternative embodiments, private networks, including corporate intranets or extranets may be used to connect a data center 218 with one or more properties 216.

In some embodiments, the Customer Corporate Data Center 218 contains the bulk of the network servers supporting gaming properties owned by the corporation.

Major elements of the gaming service network include Auth server 232, Gaming Management Server 236, and Progressive Server 238. In some embodiments, Auth Server 32 provides authentication, authorization and content integrity for client devices attempting to interact with other servers and services in the architecture.

5 In some embodiments, the Gaming Management Server 36 includes the following services: Boot Service, Name Service, Time Service, Game Management Service, Game Update Service, Event Management Service, Accounting Service, and Discovery Service.

10 In some embodiments, the Progressive Server 38 hosts a value-add service that allows a gaming device to participate within a progressive gaming offering. Any value-add service can be added or substituted for this server/service. A progressive game offering is provided as an example. Other value-add services can be distributed on existing servers or reside on a newly added server.

15 The Customer Property 16 contains gaming machines 10, which in some embodiments allow remote updates and configuration through a network interface on the gaming machine. In some embodiments, a Boot Server 234 contains a DHCP service that facilitates the distribution of IP addressing to the gaming machines 10. It should be noted that any device capable of supporting a wagering game could be substituted for gaming machine 10. For example, a personal or laptop computer
20 executing a wagering game may participate in the gaming network using the services described below.

25 The various servers and gaming machines typically include one or more computer-readable media, such as RAM, ROM, floppy disks, hard disks, flash memory, CD-ROM and DVD-ROM and other such devices to store service related and other information.

As noted above, various services may be located throughout the Gaming Service network. In some embodiments of the invention, a set of core operational services may include one or more of the following services:

30 Boot Service	Provides dynamic IP addressing to devices upon boot (start-up). Typically supported by Dynamic Host Configuration Protocol (DHCP).
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- Discovery Service Provides the address information of the server containing the service when prompted by the requestor as well as the service description, binding and location on the server.
- 5 Authentication Service Contains the master Authentication Database. Authenticates the service user before allowing the use of services in the Gaming Services Framework.
- Authorization Service Contains the master Authorization Database. Authorizes the use of services in the Gaming Services Framework by a service requestor.
- 10
- Gaming Management Service Provides the ability to configure and monitor gaming devices and other services from a central location. Further details on gaming management services may be found in United States Patent Application serial no. 10/788,661 entitled "GAMING MANAGEMENT SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT" which has been incorporated by reference above.
- 15
- 20 Name Service Provides name resolution service to enable devices in a gaming network to refer to each other by name instead of IP Address. In some embodiments the name service is implemented using the Domain Naming System (DNS) protocol.
- 25 Time Service Provides global synchronization of time in the gaming network. This may be implemented by running the Network Time Protocol (NTP) client software on gaming devices.
- 30 In addition to or instead of the core services described above, some embodiments of the invention include one or more of the following services referred to as Basic Gaming Services:
- Accounting Service Provides logging of transaction records for billing and general tracking purposes.
- 35 Event Management Service Logs events occurring at client and server devices.
- Game Software Update Service Provides dynamic distribution of new or updated game content to gaming devices. Further details

5 on a game software update service may be found in United States Patent Application serial no. 10/788,902 entitled "GAME UPDATE SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT" which has been incorporated by reference above.

10 Message Director Service This service uses a software-configurable message routing application to facilitate the reliable exchange of data messages among multiple application processes within one or more gaming systems.

15 Content Integrity Service This service provides the ability to verify the integrity of software components running in the gaming network. This includes the verification of software versions running on gaming devices, peripherals, services as well the detection of tampering or modification of the software.

20 As noted above, a gaming service network may include Value Add Services. These services include participation services and player services. Examples of participation services that may be included in various embodiments of the invention include the following:

25 Progressive Service Provides functionality for a gaming device to participate within a single progressive or multiple progressives. Further details on a progressive service may be found in United States Patent Application serial no. 10/789,957 entitled "PROGRESSIVE SERVICE IN A SERVICE-ORIENTED GAMING NETWORK ENVIRONMENT" which has been incorporated by reference above.

30 Wide Area Disruption Progressive Service This service takes over the processing of wide area progressives at each gaming site in the event that there is no connection with a central system or the connection with the central system is temporarily disabled.

5 Mobile Gaming Device GPS Service This service processes the GPS location of gaming devices compared with coordinates of a gaming jurisdiction. Example: players can ride a bus and begin gambling on the bus when the bus crosses into the gaming jurisdiction.

10 Examples of Player Services that may be included in various embodiments of the invention include:

15 Player Tracking Service This service provides the operator and player with standard player tracking applications such as monitoring card in / card out transactions to track play and award player points for play, providing targeted promotional compensation to specific players, publishing account status to the player or operator, providing temporary gaming machine locking in order to hold the machine for the player for short periods of time, and providing operators and players an interface and capability for Responsible Gaming Initiatives.

25 Game Theme Location Service This service provides location information to clients regarding specific games, game themes or vendor brands. The service may publish the information by casino, by area, by city, by state, by region, by country, or by continent depending on the input parameters provided. An example would be to publish where all of the progressive games of a particular theme (e.g., "Monopoly Money") are located in a particular hotel (e.g., the Reno Hilton) in Reno, Nevada.

35 Personalization Service This service provides the gaming player with a more personalized gaming environment. Example: the player could choose to see text in Chinese, could choose to be reminded of dinner reservation time, could customize machine graphics, or could have a portion of his coin in go to his football club's progressive.

40 Cashless Transaction Service This service provides the ability for a player to transfer funds between financial institutions, in-house accounts and gaming machines.

	Bonusing Service	This service provides the ability for casinos to set up bonus games for a specific gaming machine, carousel of machines or one or more game themes.
5	Game Service	This service is a server-side process that provides the outcome of game play. This service may be used to enable Internet/ online gaming.
10	Advertising Service	This service allows the operator to display advertising information to players in multimedia format as well as simple audio and graphic formats.
15	Property Service	This is a group of services that provides the ability for the property management company to integrate with gaming systems. It can provide interaction with functions such as hotel and restaurant reservations.

It should be noted that with the distributed architecture of the Gaming Service Network 210, the above-described services that reside on network servers are not limited to location and can reside anywhere the network supports. For example, it is desirable to consider security and network latency when locating services.

FIG. 3 is a block diagram of a Gaming Services Framework 300 according to various embodiments of the invention. In some embodiments, the Gaming Services Framework 300 includes a set of protocols, XML schemas, and methods for providing gaming system functionality in a distributed, network-based architecture such as the network described above in FIG. 2. In order to participate in such network-based architectures, the participating devices are interconnected via public or private networks that may be wired or wireless networks. Further, devices performing service communication support a common services protocol stack such as the Gaming Services Protocol Stack that is further described below.

The Gaming Services Framework 300 provides for the interaction of several logical elements as depicted in FIG. 3. Logical elements represent the fundamental entities that interact to implement a service. In some embodiments, these logical elements include Service Requestor 302, Service Provider 304, and Discovery

Agency 306. In general terms, the roles these elements play are as defined in Web Services Architecture - W3C Working (Draft 14 November 2002 and later versions). Further details on these elements are provided below.

Logical elements may reside in a number of different physical devices as part of delivering any service. For example, a Service Provider 304 will typically reside in a slot accounting or player tracking system and the Service Requestor 302 will typically reside in a gaming machine. However, there may be scenarios where it would be advantageous or appropriate for the logical elements to reside in other physical devices. For example, in alternative embodiments a Service Requestor 302 may reside in a slot accounting system.

Service Provider 304 comprises a platform that provides hosts access to a service 314. A service provider may also be referred to as a service execution environment or a service container. Its role in the client-server message exchange patterns is that of a server.

Service Requestor 302 comprises an application that is looking for and invoking or initiating an interaction with a service such as that provided by service provider 304. Its role in the client-server message exchange patterns is that of a client 312.

Discovery Agency 306 comprises a searchable set of service descriptions where service providers 304 publish their service description(s) 324 and service location(s) 326. The service discovery agency 306 can be centralized or distributed. A discovery agency 306 can support both patterns where service descriptions 322 are sent to discovery agency 306 and patterns where the discovery agency 306 actively inspects public service providers 304 for service descriptions 322. Service requestors 302 may find services and obtain binding information (in the service descriptions 324) during development for static binding, or during execution for dynamic binding. In some embodiments, for example in statically bound service requestors, the service discovery agent may be an optional role in the framework architecture, as a service provider 304 can send the service description 322 directly to service requestor 302. Likewise, service requestors 302 can obtain a service

description 324 from other sources besides a discovery agency 306, such as a local file system, FTP site, URL, or WSDL document.

FIG 4 provides a block diagram of a Gaming Services Protocol Stack 400 according to embodiments of the invention. In some embodiments, the protocol stack includes core layers that define basic services communication and transport, and are typically implemented uniformly. Higher layers that define strategic aspects of gaming processes are also described below. FIG 4 illustrates both the widely implemented core layers and in addition illustrates the higher gaming services oriented layers of the protocol stack.

Core Layers of the Gaming Services Protocol Stack 400

In some embodiments, the gaming services framework uses common Internet protocols, which may include web services protocols. Although not specifically tied to any transport protocol, it is desirable to build the gaming services on ubiquitous Internet connectivity and infrastructure to ensure nearly universal reach and support. In some embodiments, gaming services will take advantage of Ethernet 405 or 406, Transmission Control Protocol (TCP) 408, Internet Protocol (IP) 407, User Datagram Protocol (UDP) 409, HyperText Transfer Protocol (HTTP) 410, HyperText Transfer Protocol Secure/Secure Socket Layer (HTTPS/SSL) 411, Lightweight Directory Access Protocol (LDAP) 412, Domain Naming System (DNS) 413, and Dynamic Host Configuration Protocol (DHCP) 414 layers in the protocol stack 400. Those of skill in the art will appreciate that other protocol layers performing equivalent functionality may be substituted for those described above and are within the scope of the inventive subject matter.

In some embodiments, service request and response data are formatted using Extensible Markup Language (XML) 415. XML 415 is a widely accepted format for exchanging data and its corresponding semantics. XML is a fundamental building block used in layers above the Common Internet Protocols. In some embodiments, the Gaming Services Protocol Stack 400 incorporates this protocol in accordance with the World Wide Web Consortium (W3C) XML Working Group's XML specification. However, those of skill in the art will appreciate that other data

exchange formats may be substituted for XML 415, and such formats are within the scope of the inventive subject matter.

In some embodiments of the invention, the gaming service protocol stack 400 utilizes the Simple Object Access Protocol (SOAP) 416. SOAP 416 is a
5 protocol for messaging and RPC (Remote Procedure Call) style communication between applications. SOAP is based on XML 415 and uses common Internet transport protocols like HTTP 410 to carry data. SOAP 416 may be used to define a model to envelope request and response messages encoded in XML 415. SOAP 416 messaging can be used to exchange any kind of XML 415 information. SOAP 416 is
10 used in some embodiments as the basic standard for carrying service requests/responses between service users and providers. SOAP 416 has been submitted to the World Wide Web Consortium (W3C) standards body as recommendation documents (versions 1.1 and 1.2) and will likely emerge as "XML Protocol (XP)."

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Higher Layers of the Gaming Services Protocol Stack 400

In some embodiments, the gaming services protocol stack includes a Web Services Description Language (WSDL) 417 and a Universal Description, Discovery, and Integration (UDDI) 418. WSDL 417 comprises a description of how
20 to connect to a particular service. In some embodiments, WSDL 417 is based on XML. A WSDL 417 description abstracts a particular service's various connection and messaging protocols into a high-level bundle and forms an element of the UDDI 418 directory's information. WSDL 417 is similar to CORBA or COM IDL in that WSDL 417 describes programmatic interfaces. WSDL 417 is typically independent
25 of the underlying service implementation language or component model, and focuses on an abstract description. The Gaming Services Protocol Stack 400 incorporates this description in accordance with the World Wide Web Consortium (W3C) Web Services Description Language (WSDL) 1.1 - W3C Note 15 March 2001 and later versions.

30 In some embodiments, UDDI 418 represents a set of protocols and a public directory for the registration and real-time lookup of services. UDDI 418 enables an

entity such as a company to publish a description of available services to the registry, thereby announcing itself as a service provider. Service users can send requests conforming to the UDDI 418 schema as SOAP 416 messages to the service registry to discover a provider for services. Some embodiments of the inventive
5 subject matter may utilize UDDI Version 3, released in July of 2002 and later versions. Further development of UDDI 418 is managed under the auspices of the OASIS (Organization for the Advancement of Structured Information Standards) UDDI Specifications technical committee.

Referring further to FIG. 4, in one alternative embodiment, web services
10 extensions 420 may also be supported by and used in the gaming services framework. Web services extensions compose together to provide, for example but not by way of limitation, interoperable protocols for Security, Reliable Messaging and Transactions in loosely coupled systems. The web service extensions 420 build on top of the core XML and SOAP standards. These technologies may or may not
15 be industry agreed upon protocols that provide web services with more functionality, or alternatively may be supplemented with proprietary protocols to provide web services. Further, these web service extensions are based on the SOAP communications protocol as web services are. Thus, in one example embodiment, when a web service with more functionality than what the base SOAP protocol
20 provides is needed, these SOAP extensions can be added into the existing web service SOAP envelope. In addition, SOAP can be used as a protocol in any messaging application, and doesn't have to be a web service.

Referring to FIG. 5, there is illustrated one example embodiment 500 of an implementation of web service extensions 420. In this embodiment, the web service
25 extensions fit within a SOAP envelope 502. The SOAP envelope 502 may include a SOAP envelope 504, and within the envelope 504 there may be a SOAP header 506 and the SOAP body 508. Each web service extension is provided as a new SOAP binding. Some of these bindings may go in the header 506 and some may go in the body 508. For example, the web services extension known as "WS-Security" goes in
30 the SOAP header 506 of the SOAP envelope 504. The web services extension

known as "WS- Reliable Messaging" is similar to the WS-Security binding in that it goes in the header 506 as well. On the other hand, the web services extension known as "WS-Eventing" binding goes in the SOAP body 508 of the SOAP envelope 504.

According to one example embodiment, web service extensions 420, often referred to as "WS-*" specifications, may include or be selected from any industry standard extensions or from extensions published or promulgated by public or private enterprises. According to one example embodiment, some of the web services extensions may be selected from the Windows Communication Foundation. According to another example embodiment, such web service extensions may be defined and promulgated by the Organization for the Advancement of Structured Information Standards (OASIS), which is a global consortium that drives the development, convergence and adoption of e-business and web service standards, or the World Wide Web Consortium (W3C). Other web services extensions may be provided by private (or public) enterprises, such as IBM Corporation, Microsoft Corporation, Hewlett Packard Corporation, Verisign, Inc., and many others. Such specifications may include messaging, including Message Transmission Optimization Mechanism (MTOM), security, reliable messaging, transaction, metadata, XML, management, business process specification and profiles specifications. Further information on web services extensions are currently published on the World Wide Web by the CDBI Forum, under the name CDBI Web Services Roadmap.

According to one example embodiment, the WS-Security and WS-Reliable Messaging web service extensions may be used as follows in a gaming system to accomplish a gaming system objective. A gaming machine 10, or any other client device in a gaming system, may need to pass a message to a web service while ensuring the following two things:

- 1) The message is secure; and
- 2) The message is guaranteed to be delivered to the web service regardless of software component, system, or network failures.

The client application (such as client 312) creates a SOAP envelope 504 with a SOAP header 506 utilizing WS-Security and WS-Reliable Messaging web service extensions 420. Next, the client application adds the SOAP body 508 to the SOAP envelope 504. The SOAP body 508 contains the contents of the message the client
5 needs to send to the web service. Upon receiving the SOAP envelope 504, the web service analyzes the security section of the SOAP header 506 and verifies that the message passes a security check. The web service then analyzes the Reliable Messaging section of the SOAP header 506 and creates a reply SOAP message to send back to the client which indicates that the messages was received. If the client
10 does not receive this reply from the web service within a preset time frame, the client will resend the original message. After the web service has processed the SOAP header 506, it can then process the message contained within the body of the SOAP envelope 502 that was sent by the client.

Referring now to FIG. 6, a generalized method 600 according to one
15 example embodiment of using web service extensions in a gaming system framework is illustrated. A client in a first computer or device in a gaming system formulates a web service request 610 using a web service extension. The request relates to the operation of a gaming machine or system. The request using the web service extension 420 is sent 620 to a web service 620, and the web service analyzes
20 or performs 630 the request pursuant to the requirements of the web service extension, and acts upon it as necessary.

Returning to FIG. 3, the service requestors and service providers use any of the above-described protocol stacks to perform service interactions with one another. The service interactions include publish 330, discover (find) 332, and
25 interact 334.

Publish interaction 330 provides a mechanism for a service to be made accessible by other entities in the gaming network environment. In order to be accessible, a service needs to publish its description such that the requestor can subsequently find it. Where it is published can vary depending upon the
30 requirements of the application. A service description 322 can be published using a variety of mechanisms known in the art. The various mechanisms used by the

varying embodiments of the invention provide different capabilities depending on how dynamic the application using the service is intended to be. The service description may be published to multiple service registries using several different mechanisms. The simplest case is a direct publish. A direct publish means the
5 service provider sends the service description directly to the service requestor. In this case the service requestor may maintain a local copy of the service description
322.

Another means of publishing service descriptions utilized in alternative embodiments of the invention is through a UDDI registry. There are several types of
10 UDDI registries known in the art that may be used depending on the scope of the domain of Web services published to it. When publishing a Web service description to a UDDI registry, it is desirable to consider the business context and taxonomies in order for the service to be found by its potential service consumers. Examples of UDDI registries used in the gaming service architecture of various embodiments of
15 the invention are Internal Enterprise Application UDDI registry, Portal UDDI registry, and Partner Catalog UDDI registry.

An Internal Enterprise Application UDDI registry may be used in some embodiments for gaming services intended for use within an organization for internal enterprise applications integration. For example, all services that provide
20 gaming and gaming management to devices within a casino or casino organization may be published to an Internal Enterprise Application UDDI registry.

A Portal UDDI registry may be used in some embodiments for gaming services that are published by a company for external partners to find and use. A portal UDDI registry typically runs in the service provider's environment outside of
25 a firewall or in a DMZ (de-militarized zone) between firewalls. This kind of private UDDI registry generally contains only those service descriptions that a company wishes to provide to service requestors from external partners through a network. For example, these services may be used to provide online gaming to customers connecting through the World-Wide Web.

30 A Partner Catalog UDDI registry may be used in some embodiments for gaming services to be used by a particular company. The Partner Catalog UDDI

registry can be thought of as a rolodex like UDDI registry. A Partner Catalog UDDI registry is typically located on a computer or gaming device behind a firewall. This kind of private UDDI registry typically contains approved, tested, and valid service descriptions from legitimate (e.g. authorized) business partners. The business
5 context and metadata for these services can be targeted to the specific requestor. In some embodiments, this type of registry may be used for inter-casino services as well as interactions between casinos and other types of organizations such as regulators and financial institutions. It is desirable that an appropriate authorization and qualification procedure be in place to insure that only approved services are
10 published to service repositories.

In the discover interactions 332 (also referred to as find interactions), the service requestor retrieves a service description directly or queries the registry for the type of service required. It then processes the description in order to be able to bind and invoke it.

15 As with publishing service descriptions, acquiring service descriptions may vary depending on how the service description is published and how dynamic the service application is meant to be. In some embodiments, service requestors may find Web services during two different phases of an application lifecycle - design time and run time. At design time, service requestors search for web service
20 descriptions by the type of interface they support. At run time, service requestors search for a web service based on how they communicate or qualities of service advertised.

With the direct publish approach noted above, the service requestor may cache the service description at design time for use at runtime. The service
25 description may be statically represented in the program logic, stored in a file, or in a simple, local service description repository.

Service requestors can retrieve a service description at design time or runtime from a Web page (URL), a service description repository, a simple service registry or a UDDI registry. The look-up mechanism typically supports a query
30 mechanism that provides a find by type of interface capability (for example, based on a WSDL template), the binding information (i.e. protocols), properties (such as

QOS parameters), the types of intermediaries required, the taxonomy of the service, business information, etc.

The various types of UDDI registries, including those described above, have implications on the number of runtime binding services can choose from, policy for choosing one among many, or the amount of pre screening that will be done by the requestor before invoking the service. Service selection can be based on binding support, historical performance, quality of service classification, proximity, or load balancing. It is desirable that an appropriate authorization and qualification procedure be in place to insure that only approved services are published to service repositories.

Once a service description is acquired, the service requestor will need to process it in order to invoke the service. In some embodiments, the service requestor uses the service description to generate SOAP requests or programming language specific proxies to the service. The generation of such requests can be done at design time or at runtime to format an invocation to the service. Various tools can be used at design time or runtime to generate programming language bindings from interface descriptions, such as WSDL documents. These bindings present an API (Application Program Interface) to the application program and encapsulate the details of the messaging from the application.

After a service has been published 330 and discovered 332, the service may be invoked so that a service requestor and service provider may interact 334. In the interact operation 334, the service requestor invokes or initiates an interaction with the service at runtime using the binding details in the service description 322 to locate, contact, and invoke the service. Examples of service interactions 334 include: single message one way, broadcast from requester to many services, a multi message conversation, or a business process. Any of these types of interactions can be synchronous or asynchronous requests.

In some embodiments of the invention, security mechanisms may be used to secure the Gaming Services Framework 300. Securing the Gaming Services Framework typically involves providing facilities for ensuring the integrity and confidentiality of the messages and for ensuring that a service acts only on requests

in messages that express the claims required by policies. Examples of such mechanisms used in various embodiments of the invention include IPSec and SSL/TLS, which provide network and transport layer security between two endpoints. However, when data is received and forwarded on by an intermediary
5 beyond the transport layer both the integrity of data and any security information that flows with it may be lost. This forces any upstream message processors to rely on the security evaluations made by previous intermediaries and to completely trust their handling of the content of messages. Thus it is desirable to include security mechanisms that provide end-to-end security, for example as may be provided by
10 web services extensions as described above. It is also desirable that such mechanisms be able to leverage both transport and application layer security mechanisms to provide a comprehensive suite of security capabilities.

Conclusion

15 Systems and methods providing a service-oriented gaming network environment have been disclosed. Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that any arrangement which is calculated to achieve the same purpose may be substituted for the specific embodiments shown. This application is intended to
20 cover any adaptations or variations of the inventive subject matter.

The terminology used in this application is meant to include all of these environments. It is to be understood that the above description is intended to be illustrative, and not restrictive. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. Therefore, it is manifestly
25 intended that the inventive subject matter be limited only by the following claims and equivalents thereof.

Claims

What is claimed is:

- 5 1. A system providing a gaming network environment, the system comprising:
 at least one gaming machine communicably coupled to a network; and
 at least one service provider communicably coupled to the network, said
service provider operable to perform a service;
 wherein the gaming machine issues a request for the service and the service
10 provider responds to the request for the service, said request and response formed
using standard internetworking protocols; and
 further including one or more of the services are provided using web service
extensions.
- 15 2. The system of claim 1, further comprising a discovery agent communicably
coupled to the network, said discovery agent providing a discovery service and
wherein the service provider is operable to publish data for the service to the
discovery agent and wherein the gaming machine is operable to query the discovery
agent for the availability of the service.
- 20 3. The system of claim 1, wherein the service comprises a service selected from
the group of: a boot service, a gaming management service, an accounting service,
an authentication service, an authorization service, an event management service, a
gaming software update service, a message directory service, a content integrity
25 service, a progressive gaming service, a mobile gaming device location service, a
player tracking service, a game theme location service, a personalization service, a
cashless transaction service, a bonusing service, a game outcome service, an
advertising service, or a property management service.
- 30 4. The system of claim 1, wherein the service is a gaming management service
and is operable to provide configuration data.

5. The system of claim 1 wherein the service is a mobile gaming device location service and is a GPS based service.
- 5 6. The system of claim 1, wherein the standard internetworking protocols includes a services description language protocol layer.
7. The system of claim 6, wherein the services description language protocol layer is a version of the WSDL web services description language protocol.
- 10 8. The system of claim 6, wherein the standard internetworking protocols includes a service discovery protocol layer.
9. The system of claim 8, wherein the service discovery protocol layer
15 comprises the UDDI (Universal Description Discovery and Integration) protocol layer.
10. A method comprising:
in a gaming network issuing a request from a gaming device for a service;
20 and
a service provider responding to the request for the service, said request and response formed using standard internetworking protocols and further wherein the services is provided using at least one web service extensions.
- 25 11. The method of claim 10, further comprising a discovery agent communicably coupled to the network, said discovery agent providing a discovery service and wherein the service provider is operable to publish data for the service to the discovery agent and wherein the gaming machine is operable to query the discovery agent for the availability of the service.

30

12. The method of claim 10, wherein the service comprises a service selected from the group of: a boot service, a gaming management service, an accounting service, an authentication service, an authorization service, an event management service, a gaming software update service, a message directory service, a content
5 integrity service, a progressive gaming service, a mobile gaming device location service, a player tracking service, a game theme location service, a personalization service, a cashless transaction service, a bonusing service, a game outcome service, an advertising service, or a property management service.
- 10 13. The method of claim 10, wherein the service is a gaming management service and is operable to provide configuration data.
14. The method of claim 10 wherein the service is a mobile gaming device location service and is a GPS based service.
- 15 15. The method of claim 10, wherein the standard internetworking protocols includes a services description language protocol layer.
16. The method of claim 15, wherein the services description language protocol
20 layer is a version of the WSDL web services description language protocol.
17. The method of claim 15, wherein the standard internetworking protocols includes a service discovery protocol layer.
- 25 18. The method of claim 17, wherein the service discovery protocol layer comprises the UDDI (Universal Description Discovery and Integration) protocol layer.

19. A computer readable medium having stored thereon computer code operable on one or more computers in a gaming network to issue a request from a gaming device for a service; and
- operable to cause a service provider to respond to the request for the service,
- 5 wherein the request and response are formed using standard internetworking protocols and further wherein the services is provided using at least one web service extensions.
20. The computer readable medium of claim 19, wherein the service comprises a
- 10 service selected from the group of: a boot service, a gaming management service, an accounting service, an authentication service, an authorization service, an event management service, a gaming software update service, a message directory service, a content integrity service, a progressive gaming service, a mobile gaming device location service, a player tracking service, a game theme location service, a
- 15 personalization service, a cashless transaction service, a bonusing service, a game outcome service, an advertising service, or a property management service.

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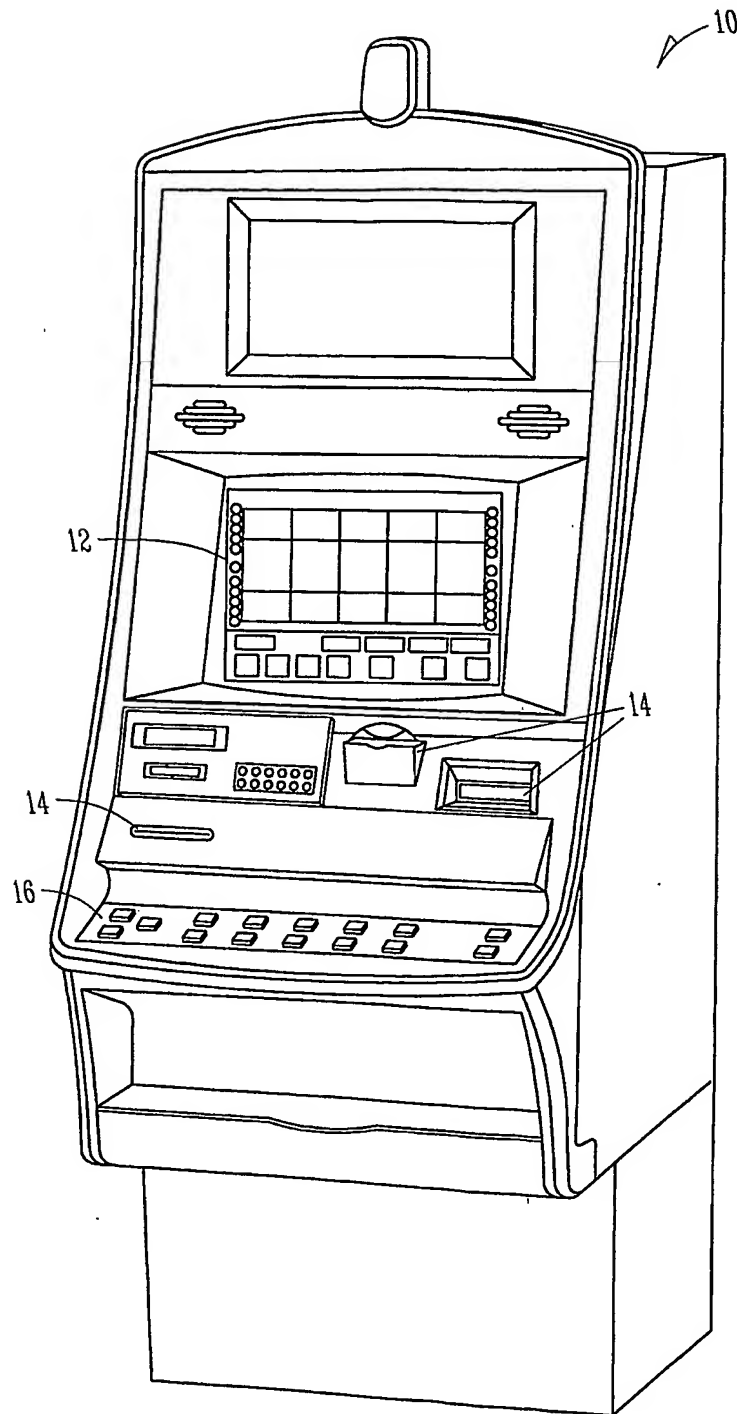


FIG. 1

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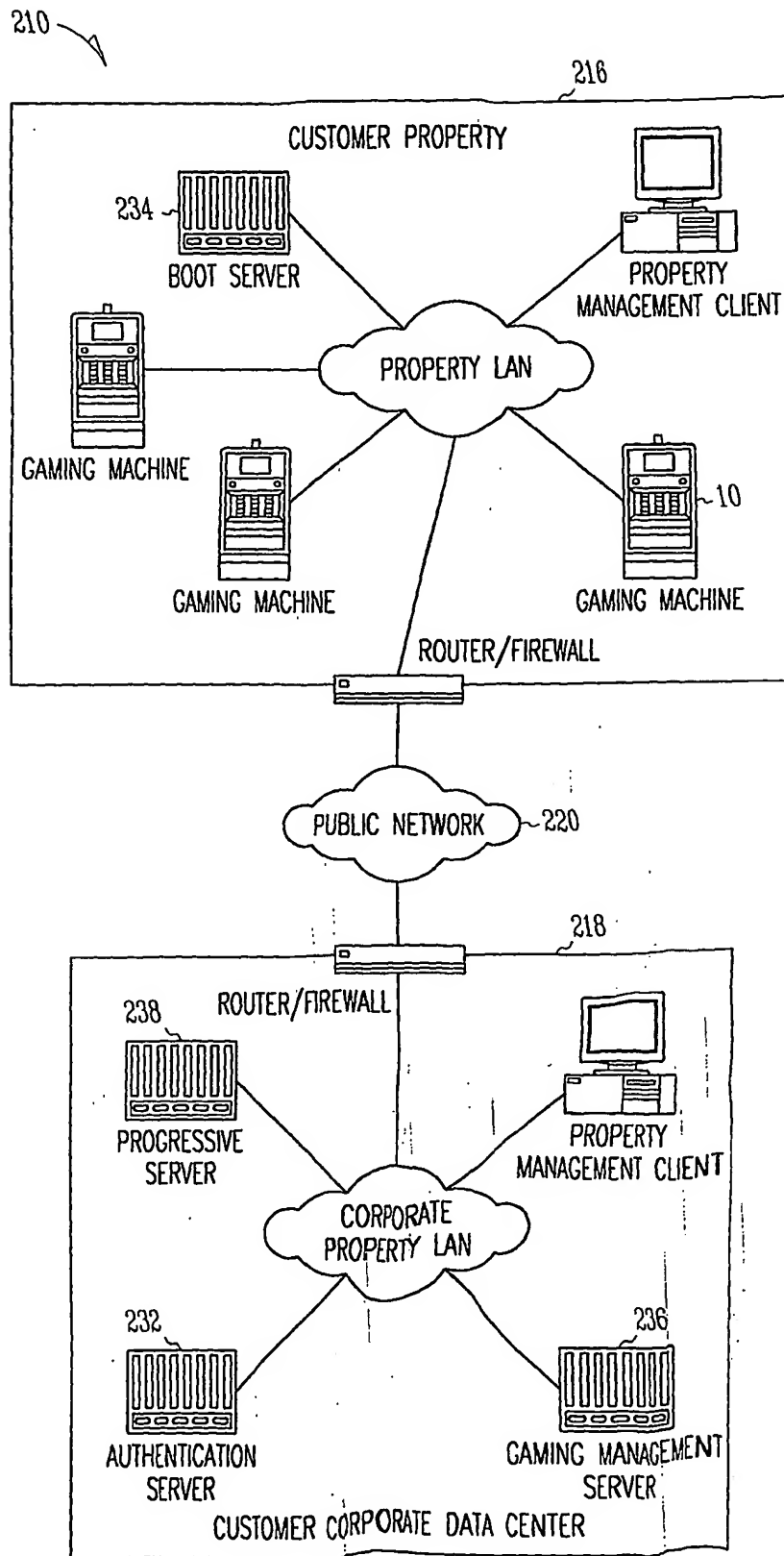


FIG. 2

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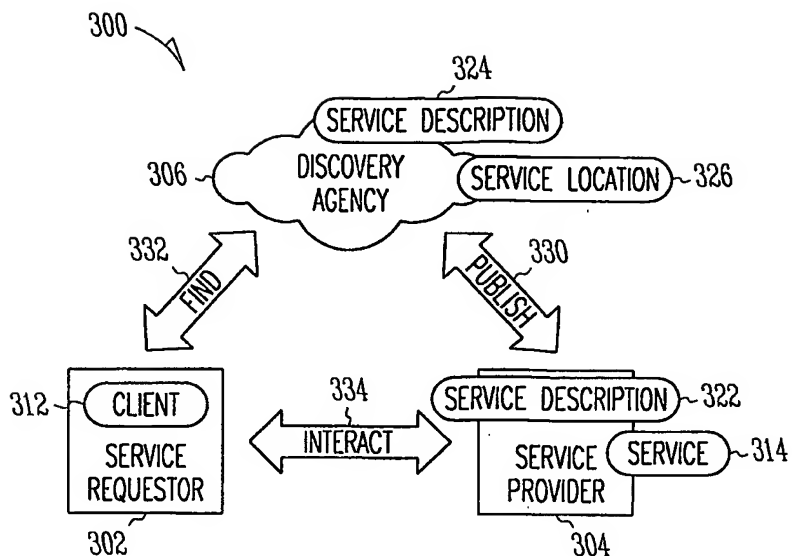


FIG. 3

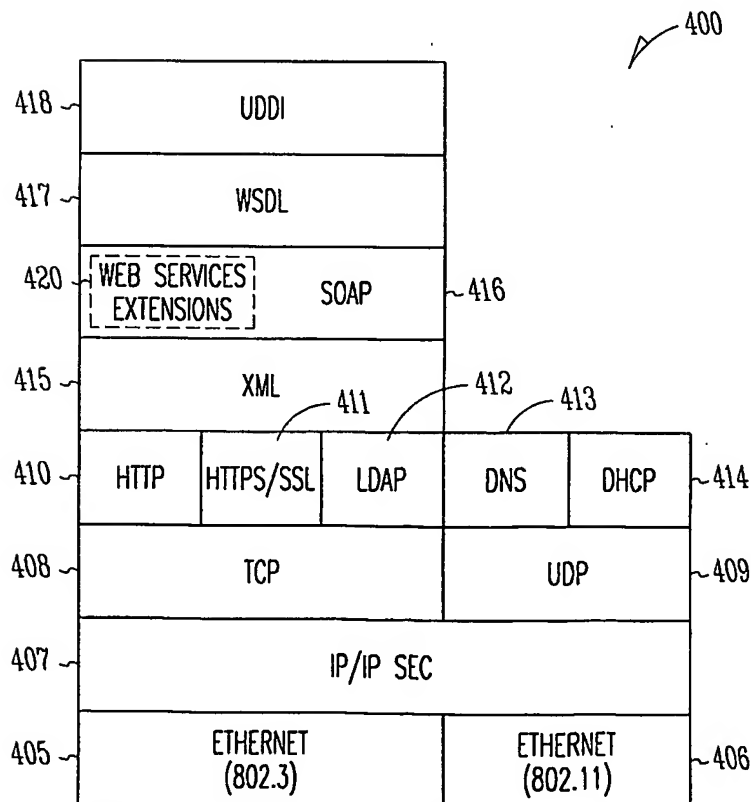
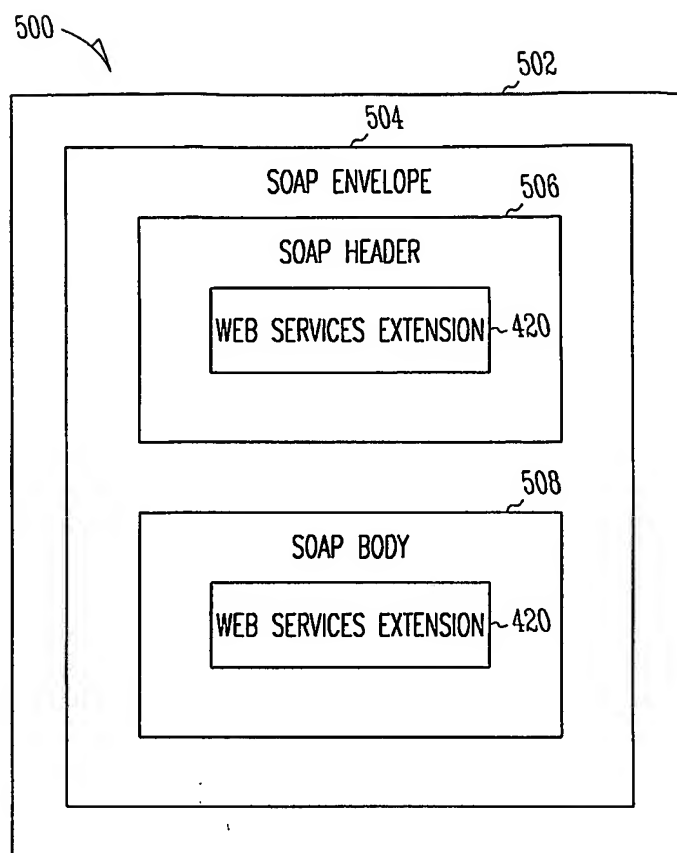
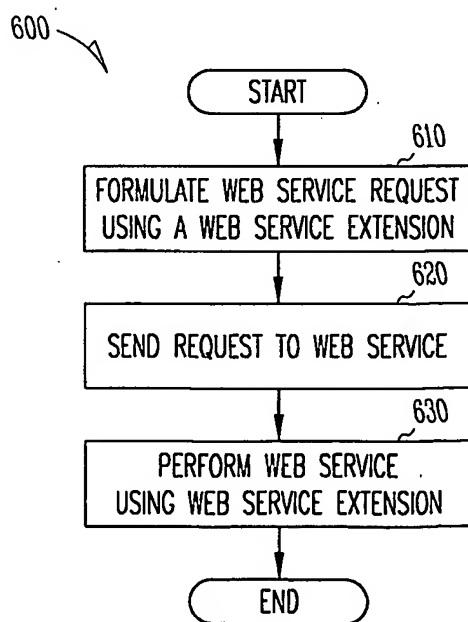


FIG. 4

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*FIG. 5**FIG. 6*